

**TWO NEW SPECIES AND A NEW RECORD OF *EUCOENOGENES* MEYRICK  
(LEPIDOPTERA: TORTRICIDAE) FROM THAILAND WITH A DISCUSSION  
OF CHARACTERS DEFINING THE GENUS**

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*Abstract.*—Two **new species** of *Eucoenogenes* Meyrick (Lepidoptera: Tortricidae: Eucosmini), *E. bicucullus* Pinkaew and *E. vaneae* Pinkaew, are described and illustrated from montane evergreen forest in Thong Pha Phum National Park, Kanchanaburi Province, Thailand. *Epinotia munda* Diakonoff, described from a female collected in Sumatra, is transferred to *Eucoenogenes* (**n. comb.**) based on male and female specimens collected in Thailand; the imago and genitalia of both sexes are described and illustrated. Characters for defining the genus are discussed and illustrated.

*Key Words:* new combination, distribution records, generic characters, *Acroclita*, *Epinotia*, Eucosmini

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*Eucoenogenes* Meyrick, 1939, was proposed as a replacement name for *Caenogenes* Meyrick, 1937, which was preoccupied by *Caenogenes* Walsingham, 1887. Meyrick (1937) described the type species, *Caenogenes melanancalis*, based on two specimens reared from larvae mining leaves of *Eugenia jambolana* Lamark (Myrtaceae) in India. Meyrick defined the genus by the thickened palpus with densely appressed scales concealing the third segment, the absence of the  $R_4$  vein in the forewing, and absence of the  $M_2$  vein in the hindwing. Clarke (1958) designated a female as lectotype, noting that “the male is missing,” even though Meyrick indicated that both specimens were female in his original description. However, Clarke (1955) previously noted that Meyrick often misidentified sexes because of his reliance on a hand

lens and emphasis on non-genitalic characters; thus, the sex and present location of the second specimen is uncertain. In contrast to Meyrick’s description, Clarke’s figure of venation showed that both  $R_4$  in the forewing and  $M_2$  in the hindwing were present and that all veins were separate except the fused anal veins in the forewing and the stalked  $M_3$ - $CuA_1$  in the hindwing; this venation has been confirmed by a re-examination of the venation of the lectotype.

Diakonoff (1967) considered the female genitalia of *E. melanancalis* to lack characters of generic significance and considered the palpi with appressed scales and concealment of the third segment to be the only character defining the genus. Based on similar palpi, Diakonoff described *E. deltostoma* based on a single male specimen from the Philippine Islands. This descrip-

tion of the male genitalia gave an identity to the genus that was lacking in Meyrick's description, specifically the possession of enlarged spiniform setae originating from the sacculus. Subsequently, additional species of *Eucoenogenes* have been described or transferred to the genus based largely on the possession of the saccular spiniform setae. These species vary, some intraspecifically, in the degree that the scales of the second segment of the labial palpus are appressed and cover the third segment; thus, this character may be an artifact of individual specimens. Other characters for defining the genus have not been provided previously.

*Eucoenogenes* currently includes 11 species occurring in the Oriental and eastern Palearctic regions. Three species have been reported previously from Thailand (Kawabe 1989): *ancyrota* Meyrick (1907), *euphlebia* Kawabe (1989), and *japonica* Kawabe (1978). In addition to these three species and *E. melanancalis* and *E. deltosoma*, other species of *Eucoenogenes* include *aestuosa* and *cyanopsis*, described by Meyrick (1912) from India, *levatana* Kuznetsov (1997a) and *segregana* Kuznetsov (1997b) from South Vietnam, *pythonias* (Meyrick 1910) from Java, and *teliferana* (Christoph 1882) from Vladivostok, Russia, the sole species occurring outside the Oriental Region.

About 200 species of Olethreutinae were collected during a recent (2001–2003) survey of Tortricidae in the Thong Pha Phum National Park, Thailand (Kanchanaburi Province). Of these, two new species of *Eucoenogenes* are described here and an additional species is transferred from *Epinotia* to *Eucoenogenes* and reported as a new record for Thailand.

#### MATERIALS AND METHODS

Tortricidae were sampled in Thong Pha Phum National Park at elevations from 200 m to 1,000 m in habitats that included swamp forest, riparian forest, deciduous forest, evergreen forest, dry evergreen forest, and montane evergreen forest. All spec-

imens were collected with a 20-watt black-light suspended in front of a sheet and operated with a car battery. Collections were made on 145 nights in all forest types at various elevations in the park. Some collection sites were accessible by vehicle, and others required 2–3 days of hiking to sample. Latitude and longitude were recorded with a Magellen GPS 315. Specimens were transported in relaxing boxes lined with cotton to prevent sliding of specimens and scale loss. All specimens were spread in the laboratory within a week of collection.

A Leica 12.5 stereomicroscope with an ocular micrometer and fiber optic illumination was used to examine, measure, and illustrate specimens. Forewing length was measured from the outer edge of the tegula at wing base to the outermost edge of the fringe scales at apex and is given as an average of lengths for all measured specimens of each sex. Compound microscopes were used at magnifications of 125–400 $\times$  for examining microtrichia, cornuti, and other characters of genitalia. Scanning electron micrographs were made with a JEOL JSM-6500 FE-SEM. The "Methuen Handbook of Colour" (Kornerup and Wanscher 1983) was used as a standard for describing color patterns of adults. Genitalia preparation followed the methodology given by J. Brown and Powell (1991). Genitalia were illustrated on acetate drafting film with the use of a drawing tube. Terminology for wing venation and genitalic structures follows Horak (1984) and Horak and Brown (1991). Terminology for forewing patterns and strigulae follows R. Brown and Powell (1991), as modified and discussed by Baixeras (2002). Specimens of *Eucoenogenes* collected in Thailand were compared with identified specimens and genitalia preparations of *E. aestuosa* ( $\delta$ ,  $\text{♀}$ ), *E. ancyrota* ( $\delta$ ,  $\text{♀}$ ), *E. cyanopsis* ( $\delta$ ), *E. euphlebia* ( $\delta$ ,  $\text{♀}$ ) and *E. japonica* ( $\delta$ ,  $\text{♀}$ ) in the National Museum of Natural History, Smithsonian Institution, Washington DC (USNM) and University of Osaka Prefecture and with type specimens of *E. deltosoma* ( $\delta$ ), *E. me-*





Figs. 1–4. Adults. 1, *Eucoenogenes munda*, male. 2, *E. bicucullus*, male holotype. 3, *E. vanevae*, female paratype. 4, Labial palpus of *Eucoenogenes vanevae*.

*lanancalis* (♀ genitalia and venation), and *E. pythoias* (♂ genitalia). Identities of *E. cyanopsis* (♀), *E. teliferana* (♂), *E. levatana* (♂), and *E. segregana* (♂) were determined by examining published illustrations of imagos and genitalia (Kuznetsov 1997a, b, 2001).

*Eucoenogenes munda* (Diakonoff),  
**new combination**  
 (Figs. 1, 6–8, 12)

*Epinotia* (*Asthenia*) *munda* Diakonoff 1983: 40.

Description.—*Head*: Upper frons orange white to pale orange mixed with brownish orange, light brown laterally, lower frons light brown to brown; labial palpus with

first segment light brown mixed with brown, second segment brownish orange, with dark brown spots basally, dorsomedially, and ventrally at 2/3 length, and brownish-orange spot apically, apical segment orange white; vertex yellowish white, eye bordered posteriorly by row of brown and dark brown scales.

*Thorax*: Pronotal collar and tegula brown mixed with dark brown; mesonotum brown mixed with yellowish white and dark brown. Forewing (Fig. 1): Length: 7.3 mm in males (n = 3), 6.9 mm in females (n = 1); male costal fold absent; venation (Fig. 6) with R<sub>4</sub>–R<sub>5</sub> stalked 1/3 length of R<sub>5</sub>, termen concave between apex and M<sub>3</sub>, ground color brownish orange mixed with brown,

inner margin with patch extending from basal fascia to pretornal spot and medially to 1A+2A, yellowish white mixed with brownish grey; costal strigulae 1–9 paired, orange white to pale orange, separated by dark brown spots or short lines; basal fascia with scattered dark brown scales, distal margin extending as dark brown line from costa near strigula 1 to inner margin; sub-basal fascia present as dark brown spot between strigulae 2 and 3 and extending from costa to R, dislocated apically to form brownish orange spot with dark brown margins between middle of discal cell and 1A+2A; median fascia indistinct, present as dark brown spot on costa between strigulae 4 and 5; postmedian and preterminal fasciae present as dark brown spots on costa between strigulae 6 and 7 and 8 and 9, respectively; apex with dark brown spot extending into adjacent fringe scales; pretornal subtriangular spot extending from inner margin to  $CuA_1$ , brownish orange with dark brown margins; ocellar region with a dark brown line extending from  $R_5$  to  $CuA_1$ , scalloped between veins, outer margin with distinct dark brown line, broken by orange white, unpaired strigulae between  $R_5$  and  $M_1$ ,  $M_1$  and  $M_2$ , and  $CuA_1$  and  $CuA_2$ . Underside light brown, strigulae on costa and termen yellowish grey to yellowish white. Hindwing (Fig. 7): Brown dorsally, light brown ventrally.

*Male genitalia* (Fig. 8): Tegumen arms narrow ventrally, widened in dorsal  $\frac{1}{3}$ , with moderately dense setae dorsomedially; uncus short, apices pointed; socii pendent from base of uncus, apically rounded, moderately setose; gnathos arising from mid-length of tegumen, membranous; anellus closely surrounding basal  $\frac{1}{3}$  of aedeagus; aedeagus moderately long, apically tapered, dorsoapical  $\frac{1}{3}$  unsclerotized, cornuti moderately dense; juxta triangular; valva with small group of setae basally and large group dorsally at midlength, ventromedial area at midlength with small, rounded lobe, long setae arising from between lobe and ventral margin, microtrichia present on medial sur-

face from near base to rounded lobe, ventrolateral surface of valva with group of long, spiniform setae surrounded by microtrichia, some setae with deeply bifid apices at high magnification (400 $\times$ ), base of neck with a long, ventrally projecting, digitate process lacking setae or with a few setae near middle, cucullus small, rounded, densely setose ( $n = 2$ ).

*Female genitalia* (Fig. 12): Sternum VI densely microtrichiate on posterior half. Sternum VII densely microtrichiate except on posterolateral corners, densely setose on posterolateral corners and posteromedial area, aetose on remainder of sclerite; tergum VIII with moderately dense scales and microtrichia on lateral triangular projections; papillae anales with dense setae, some lateral setae with papillose bases; lamella antevaginalis reduced, lamella postvaginalis moderately sclerotized, with dense microtrichia and moderately dense scales; ostium bursae opening into wide, cuplike antrum; colliculum small, ringlike; ductus bursae with large sclerotized plate on anterior half, narrowly encircling ductus near middle, incompletely sclerotized on ventral side, with two, anterior extensions into corpus bursae, apices acute; ductus seminalis arising from anterior  $\frac{1}{4}$  of ductus bursae; corpus bursae with two signa, bladlike, apices acute ( $n = 1$ ).

Specimens examined.—Thailand: Kanchanaburi Prov.: Thong Pha Phum N.P., 14°27'41"N 98°37'15"E, 24 Dec. 2001 (1 ♂, genitalia slide NP 61), 14°41'34"N 98°24'06"E, 12 Jan. 2002 (1 ♂, genitalia slide NP 104), 14°41'39"N 98°24'10"E, 13 Jan. 2002 (1 ♂, genitalia slide NP 172, 1 ♀, genitalia slide NP 173), all collected by N. Pinkaew. Deposited in Department of Entomology Collection, Kasetsart University and Mississippi Entomological Museum.

Remarks.—This species was described based on a single female from Mt. Bandahara at 810 m in Atjeh, Sumatra. The type specimen was not examined, but the illustrated imago and genitalia (Diakonoff 1983)





Fig. 5. Metathoracic leg of male *Eucoenogenes bicucullus* with expanded femur covered by sex scales (arrow).

are identical to the female specimen from Thailand. These females share a similar seventh sternite and sclerotization of the ductus bursae, unlike other known *Eucoenogenes*. Specimens from Thailand were collected during the dry winter season at 980–1,000 m in montane evergreen forest.

*Eucoenogenes bicucullus* Pinkaew,  
new species

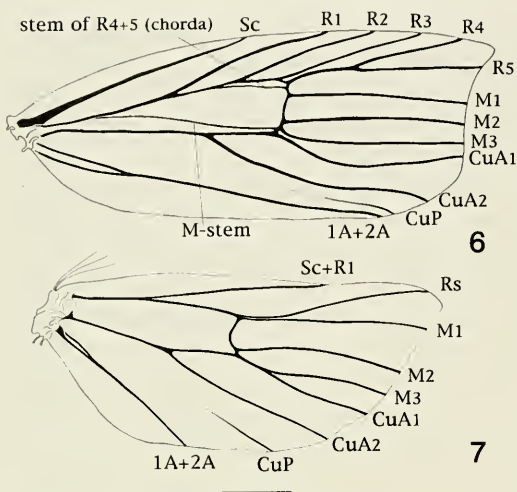
(Figs. 2, 5, 9, 13)

**Diagnosis.**—The male of this species differs from other species in the genus in having a wide, flat hindtibia with dense, setiform scales closely appressed to the medial and lateral surfaces. The anal margin of the hindwing bears a dark brown hair pencil basally and a row of long, yellowish-white hairs beyond the wing base. The male genitalia differ from those of other species by the cucullus being divided into dorsal and ventral lobes. The female is similar to that of *E. munda*, but the seventh sternum is quadrate, not rounded, and has microtrichia that are restricted to its posterolateral corners.

**Description.**—*Head:* Upper frons with light brown mixed with brownish orange, lower frons with brown to dark brown mixed with light brown; labial palpus with first segment dark brown at base, remainder yellowish white, second segment yellowish white to pale orange with dark brown spots

basally, dorsomedially, ventroapically at  $\frac{2}{5}$  length, and apically, apical segment brown dorsally, yellowish white ventrally; vertex brownish orange to light brown mixed with brown laterally.

*Thorax:* Pronotal collar with anterior short scales brown, posterior long scales light brown with orange-white apices; tegula brown mixed with dark brown basally, light brown mixed with orange white apically; mesonotum pale orange mixed with light brown to dark brown, with transverse, dark brown band medially. Forewing (Fig. 2): Length: 6.50 mm in males ( $n = 4$ ), 7.4 mm in females ( $n = 2$ ); male costal fold absent;  $R_4$ — $R_5$  stalked  $\frac{2}{5}$  length of  $R_5$ , termen slightly concave, ground color grayish yellow mixed with brownish orange, with diffuse dark brown transverse lines, costal strigulae 1–9 paired, pale yellow, and separated by dark brown, termen with strigulae forming pale yellow spots between  $R_4$  and  $R_5$ ,  $R_5$  and  $M_1$ , and  $M_1$  and  $M_2$ ; basal fascia indistinct, with scattered, dark brown scales between wing base and strigula 1 from costa to inner margin; subbasal fascia distinct between strigulae 2 and 3 from costa to  $R$ , dislocated apically from middle of discal cell to inner margin, dark brown on margins, mixed with brownish orange medially; median fascia dark brown on costa between strigulae 4 and 5, indistinct from near costa to inner margin, distal margin extending obliquely outward as narrow dark brown line bordering brownish-orange scales from costa to  $R_5$ , angled at  $R_5$ , and extending basally to middle of discal cell; silvery striae originating from strigulae 5 and 6 and extending obliquely to  $R_5$ , striae from strigulae 7–9 extending obliquely to  $R_5$ , confluent from  $R_5$  to tornal area along outer margin, striae separating brownish-orange lines originating from dark brown spots between strigulae, orange line between strigulae 5 and 6 extending to  $R_1$ , orange line between strigulae 6 and 7 extending to  $R_5$ , orange line between strigulae 7 and 8 confluent with orange line from between strigulae 8 and 9 and extending to  $R_5$ ; ocellar region



Figs. 6–7. Venation of *Eucoenogenes munda*. 6, Forewing. 7, Hindwing. Scale bar: 1 mm.

with diffuse dark brown lines from  $R_5$  to inner margin near tornus; wing apex dark brown between  $R_4$  and  $R_5$ ; outer margin with distinct dark brown line from apex to  $CuA_1$ ; fringe orange white mixed with brown and dark brown. Underside light brown, with yellowish-grey strigulae on costa and between veins on outer margin. Hindwing: Brown dorsally; male with scales narrow between anal margin and  $CuA_2$ , anal margin rolled dorsally in spread specimens and bearing row of hair pencils, basal  $\frac{2}{3}$  of row dark brown basally, yellowish white apically; ventrally light brown, with dense brown scales on basal  $\frac{2}{3}$  of costal area, with yellowish-white, narrow scales on rolled anal area; male hindtibia (Fig. 5) wide, flattened and densely covered dorsally and laterally with specialized long, setiform scales adhering closely to surface.

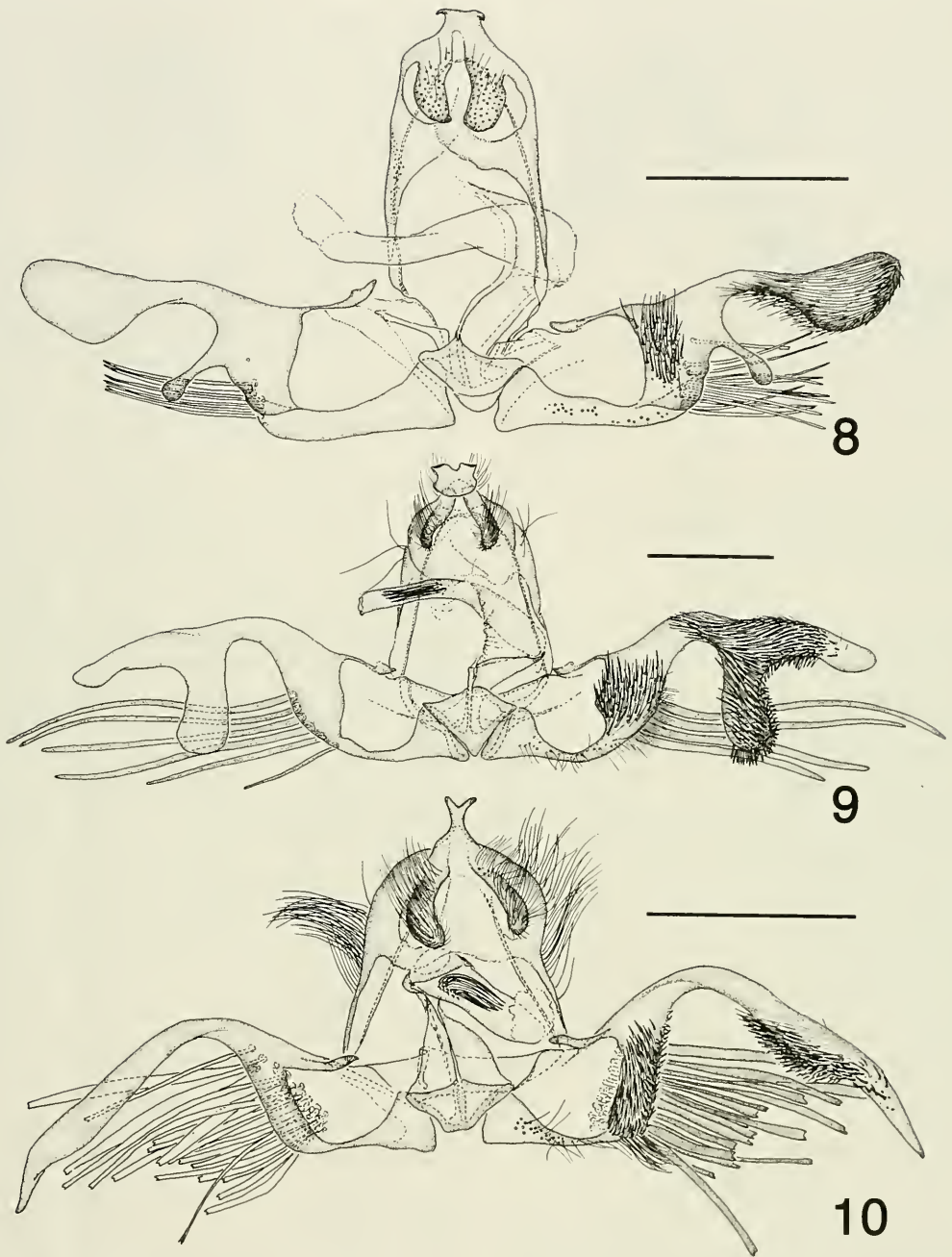
**Male genitalia** (Fig. 9): Tegumen arms moderately wide, dorsally rounded, with moderately long setae medially; uncus short, bilobed dorsally, with rounded ventral projection extending over socii bases; socii arising from base of uncus, moderately long, apically rounded, densely setose dorsoapically; gnathos arising from dorsal  $\frac{2}{3}$  of tegumen, membranous; anellus closely surrounding base of aedeagus; aedeagus

moderately long, curved medially, with eight cornuti extending along apical  $\frac{1}{3}$ ; juxta triangular; sacculus sparsely setose basally, densely setose medially between basal opening and neck, ventral margin with dense short setae between basal opening and neck, microtrichia relatively dense on medial surface from near base of sacculus to apical margin of basal opening, ventrolateral area of valva with row of 4–7, long, spiniform setae, setae with attenuate apices; valva deeply incised to form narrow neck; cucullus moderately incised medioapically forming two, long rounded lobes, dorsal lobe densely setose except apical  $\frac{1}{3}$ , ventral lobe larger than dorsal lobe, densely setose except ventrobasal margin ( $n = 3$ ).

**Female genitalia** (Fig. 13): Sternum VI with sparse microtrichia on posteromedial margin. Sternum VII with large sclerotized plate, scales moderately dense on posterior half and lateral areas, becoming more dense towards posterior margin, anteromedial area scaleless, sparsely setose on posterior half, microtrichia restricted to lateral margins; tegumen VIII without setae or scales dorsomedially, with sparse setae and moderately dense scales and microtrichia on lateral triangular extensions; papillae anales with dense setae, lateral setae with papillose bases; sterigma reduced; ostium bursae behind sternum VII, antrum forming a wide, sclerotized cup, colliculum small, weakly sclerotized, ductus bursae encircled by large sclerotized plate medially, divided anteriorly to form two triangular projections extending into corpus bursae; ductus seminalis arising from near middle of ductus bursae; corpus bursae with two signa, blade-like, rounded at apex, right signum larger than left signum ( $n = 1$ ).

**Holotype**.—Male. Thailand: Kanchanaburi Prov.: Thong Pha Phum N.P., 14°41'38"N 98°24'17"E, 30 Jul. 2002, N. Pinkaew; [specimen no.] NP10; male [genitalia slide] NP 391. Data given as on three labels except for bracketed information. Deposited in USNM.

**Paratypes**.—Thailand: Kanchanaburi Prov.:



Figs. 8–10. Male genitalia. 8, *Eucoenogenes munda*. 9, *E. bicucullus*. 10, *E. vanevae*. Scale bar: 1 mm.

Thong Pha Phum N.P., 14°41'35"N 98°24'19"E, 23 Dec. 2001, (1 ♂, genitalia slide NP 41), 14°41'17"N 98°24'02"E, 9 Jan. 2002 (1 ♀, genitalia slide NP 141), 14°41'40"N 98°24'15"E, 5 Feb. 2002 (1 ♂,

genitalia slide NP 231), 14°41'41"N 98°24'12"E, 6 Feb. 2002 (1 ♀, genitalia slide NP 180), 14°41'34"N 98°24'06"E, 12 Jan. 2002 (1 ♂, genitalia slide NP 105), all collected by N. Pinkaew. Deposited in Ka-



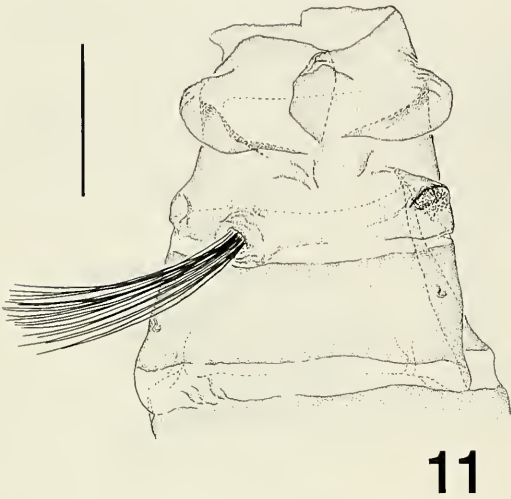


Fig. 11. *Eucoenogenes vaneae*, ventral view of male abdominal segment 8 with hair pencils intact on left side. Scale bar: 1 mm.

setsart University Entomology Collection and Mississippi Entomological Museum.

**Etymology.**—The name of this species refers to the division of the male cucullus into two parts.

**Remarks.**—The expanded hindtibia with specialized sex scales in the male is unique among species of *Eucoenogenes*. These tibial sex scales may be involved in the production of a pheromone that is disseminated by hair pencils on the hindwing, similar to pheromone systems in males of other species of Lepidoptera (Grant 1978). This species was collected during dry winter and early rainy seasons in montane evergreen forest at 980–1,000 m.

***Eucoenogenes vaneae* Pinkaew,  
new species**

(Figs. 3–4, 10–11, 14)

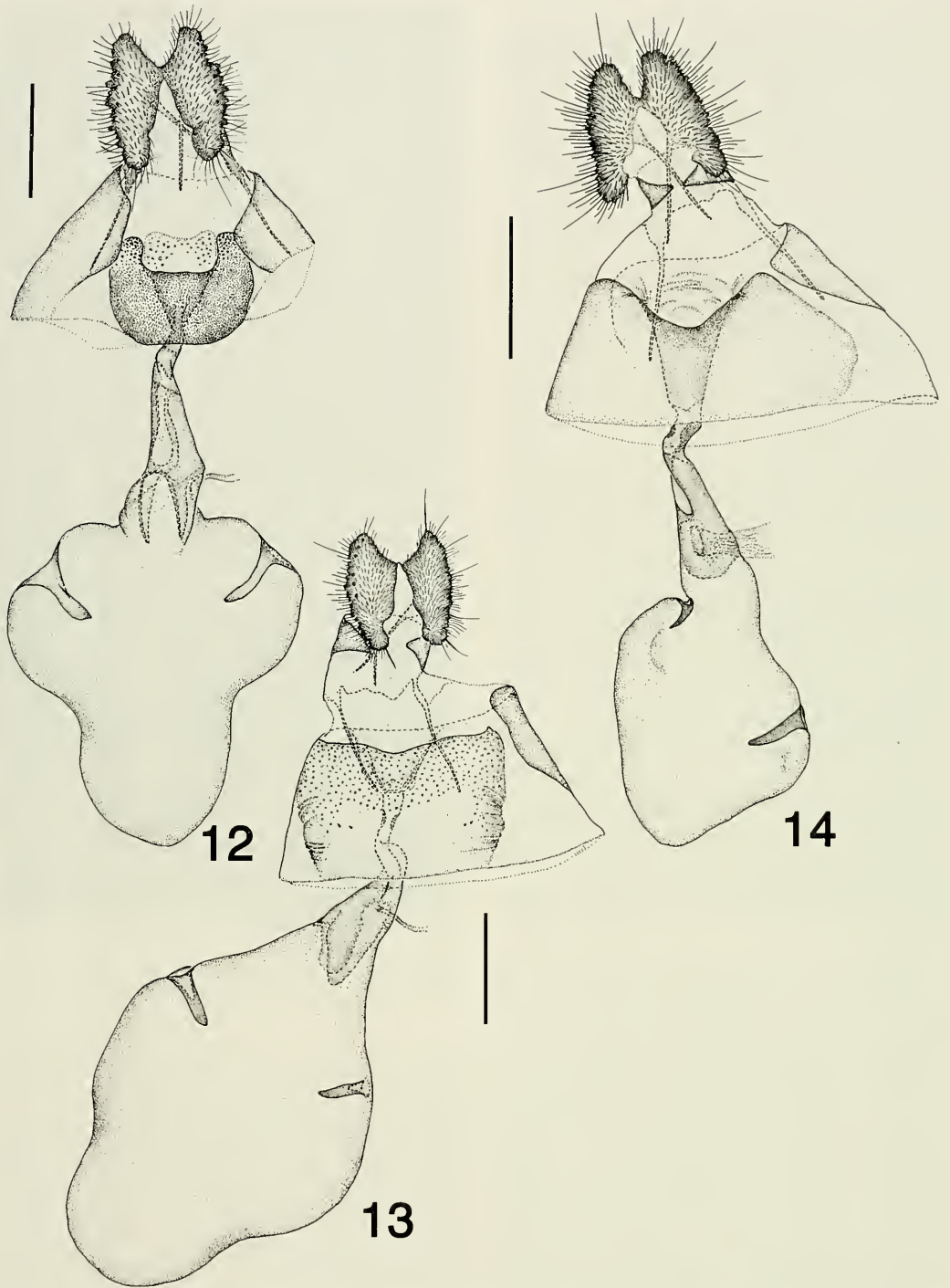
**Diagnosis.**—The male of this species differs from related species in having long hair pencils arising from anterolateral pockets of sternum VIII (Fig. 11), a sacculus bearing spiniform setae with distal scales having bifid apices and basal scales having trifid apices, and a valva that is rotated at the neck to produce a ventrally facing cucullus. This species is most similar to *E. levatana* Kuz-

netsov (1997a) in the form of the spiniform scales on the sacculus and the presence of a narrow cucullus, but differs in having the uncus narrowed medially and the rotated valva described above. A forewing costal fold is present in *E. levatana*, but is absent in this new species.

**Description.**—**Head:** Upper frons brownish orange mixed with brown to dark brown laterally, lower frons yellowish white, dark brown laterally; labial palpus (Fig. 4) with first segment orange white to pale orange, with dark brown spot apically, second segment orange white with small, dark brown spot basally, confluent with spot on first segment, dorsomedial area with small, dark brown spot, narrowly separated from large, dark brown, ventroapical spot at  $\frac{2}{3}$  length, latter spot narrowly separated from large, dark brown apical spot, apical segment orange white ventrally, dark brown dorsally; vertex dark brown anteriorly, orange white posteriorly, eye posteriorly bordered by row of dark brown and light brown scales.

**Thorax:** Pronotal collar brown to dark brown mixed with light brown; tegula dark brown mixed with light brown on basal half, light brown mixed with brown on apical half; mesonotum dark brown, with transverse light brown band. Forewing (Fig. 3): Length 5.77 mm in males ( $n = 4$ ), 6.34 mm in females ( $n = 5$ ); male costal fold absent;  $R_4$  and  $R_5$  stalked  $\frac{1}{6}$  length of  $R_5$ , termen concave between  $R_5$  and  $M_3$ ; ground color yellowish white mixed with pale orange and brownish grey; costal strigulae orange white to orange gray basally, yellowish white apically, strigulae 1–9 paired and separated by dark brown, except some specimens with strigula 6 single, termen with yellowish-white strigula between  $R_5$  and  $M_1$ ; basal fascia indistinct, with dark brown spot divided by orange-white scales between costa and R and irregular rows of dark brown scales between R and inner margin; subbasal fascia with dark brown proximal and distal margins enclosing brownish orange mixed with orange gray,





Figs. 12-14. Female genitalia. 12, *Eucoenogenes munda*. 13, *E. bicucullus*. 14, *E. vanecae*. Scale bar: 1 mm.

distinct on costa between strigulae 2 and 3 and extending to near middle of discal cell, dislocated apically between middle of discal cell and inner margin; median fascia dark brown mixed with orange, extending obliquely from costa between strigulae 4 and 5 to  $R_5$ , widened at  $R_5$  and extending transversely to  $1A+2A$ , with narrow, apically directed spur on  $R_5$ , broken by ground color at M stem in discal cell; pretornal spot subtriangular, dark brown mixed with orange surrounded by dark brown on proximal and distal margins, postmedian fascia extending obliquely from costa between strigulae 6 and 7 to  $R_5$  near outer margin, dark brown on costa, orange with some brown on distal margin from strigulae to  $R_5$ , strigulae 5 and 6 with silvery striae becoming confluent and bordering postmedian fascia to  $R_5$ , strigula 7 with silvery stria extending obliquely to  $R_5$ , strigulae 8 and 9 with striae reduced to small silvery spots, outer margin with silvery stria (possibly confluent striae) extending from  $M_2$  to  $CuA_2$ , broken near  $CuA_1$  by ground color; ocellar region with dark brown patch between  $R_5$  and  $CuA_1$ , outer margin with dark brown line from apex to  $CuA_1$ , broken by strigula between  $R_5$  and  $M_1$ . Underside light brown with yellowish-grey strigulae on costa and between  $R_5$  and  $M_1$  on outer margin. Hindwing: Brown dorsally, light brown ventrally.

*Abdomen* (Fig. 11): Male sternum VIII with two, brown hair pencils arising from pockets on anterolateral corners.

*Male genitalia* (Fig. 10): Tegumen arms narrow ventrally, widened at midlength, with dense long setae along outer margin of ventral two-thirds; uncus short, narrowed medially, with bifid apex; socii pendant from base of uncus to near half of tegumen length, densely setose, apically rounded; gnathos arising from midlength of tegumen, sclerotized basally, membranous apically; anellus closely surrounding basal one-fourth of aedeagus, extending dorsally to one-third length; aedeagus moderately long, not greatly tapered apically, with dense

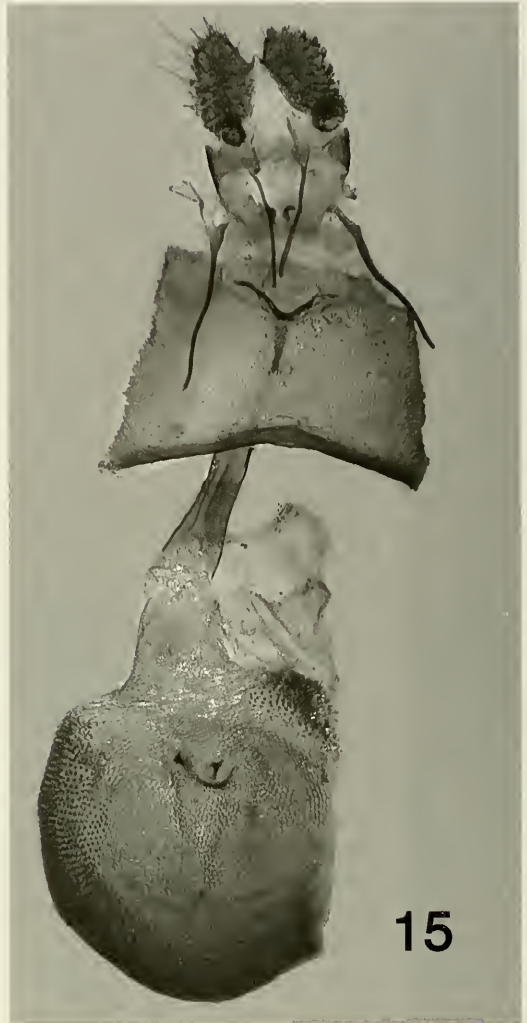
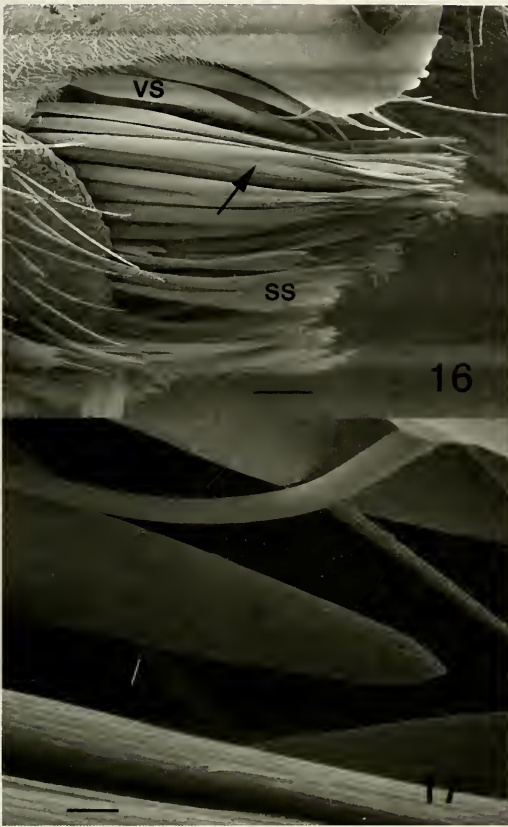


Fig. 15. Female genitalia of *Eucoenogenes melanancalis* lectotype.

bundle of 15–20 cornuti; juxta triangular, truncated ventrally; valva with group of sparse setae along ventrobasal margin of sacculus and group of dense setae medially between basal opening and neck, ventroapical margin of sacculus with short and spiniform setae, ventrolateral surface of valva with large group of long, spiniform, flattened setae with multidentate apices basally and rounded, spiniform setae with bidentate apices towards neck, setiform setae bordered basally by microtrichia, neck narrow, asetose, rotated near middle with cucullus





Figs. 16–17. Male genitalia of *Eucoenogenes*. 16, *E. cyanopsis*, lateral view of sacculus, cleft in bifid spiniform setae indicated by arrow. Abbreviations: vs = valval spiniform setae, ss = setae of sternum 9. Scale bar = 40  $\mu$ m. 17, *E. cyanopsis*, magnification of valval spiniform setae. Scale bar = 4  $\mu$ m.

facing ventrally, cucullus narrow, with dense, short setae basally, acute and sparsely setose apically ( $n = 4$ ).

**Female genitalia** (Fig. 14): Sternum VI densely microtrichiate on posterior  $\frac{2}{3}$ . Sternum VII densely scaled and microtrichiate, sparsely setose; tergum VIII moderately scaled on triangular lateral extensions; papillae anales densely setose, lateral setae with papillose bases; lamella postvaginalis short, sparsely setose and densely microtrichiate; antrum forming long, lightly sclerotized cup; colliculum small, not encircling ductus bursae; ductus bursae with long sclerotized band encircling  $\frac{2}{3}$  of ductus circumference, completely encircled by nar-

row band near middle and posterior to inception of ductus seminalis, apically rounded without projections into corpus bursae; corpus bursae with two, bladelike signa, smaller signum on posterior margin of corpus bursae near connection with ductus bursae ( $n = 1$ ).

**Holotype**.—Male. Thailand: Kanchanaburi Prov.: Thong Pha Phum N.P., 14°41'31"N 98°24'27"E, 13 May 2002, N. Pinkaew; [specimen no.] N96; male [genitalia slide] NP 464. Data given as on three labels except for bracketed information. Deposited in USNM.

**Paratypes**.—Thailand: same data as holotype (1  $\sigma$ , genitalia slide NP 452, 2  $\text{f}$ ), same data except 14°41'43"N 98°24'34"E, 15 May 2002, (1  $\sigma$ , genitalia slide NP 519, 3  $\text{f}$ , genitalia slide NP 463), 14°41'36"N 98°24'21"E, 6 Nov 2002 (1  $\sigma$ , genitalia slide NP 393). Deposited in Department of Entomology collection, Kasetsart University, Mississippi Entomological Museum, and USNM.

**Etymology**.—This species is named after the late Vanee Pinkaew, mother of the senior author.

**Remarks**.—This species was collected during the dry winter and dry summer seasons in montane evergreen forest at 980–1,000 m in the same habitat as *E. munda* and *E. bicucullus*.

#### DISCUSSION

New species of *Eucoenogenes* have been described in recent years based largely on their similarity with *E. deltosoma* in having male genitalia with enlarged spiniform setae on the sacculus. As the male of the type species, *E. melanancalis*, is unknown, the concept of the genus rests solely with the female lectotype. The genitalia of *E. melanancalis* are refigured here (Fig. 15) to provide better resolution of detail than the photograph in Clarke (1958). A re-examination of the genitalia reveals that it is unique in having two sclerotized s-shaped projections on the inner medial surface of the eighth tergite, unlike females of other

species of *Eucoenogenes* and other Oletheutinae. The sterigma is laterally fused with the seventh sternite, similar to some species of *Spilonota* Stephens that were illustrated by Clarke (1958), and unlike other species of *Eucoenogenes*. The ductus bursae is encircled by a long sclerotized band, similar to other species of *Eucoenogenes*. The corpus bursae is densely spiculate on the lateral margins, giving a halo effect, whereas the corpus bursae in other *Eucoenogenes* has spicules evenly distributed over most of its surface. Characters of the female genitalia that associate the lectotype with any other genus are lacking, and only the long sclerotized ductus bursae is shared with females of other species assigned to *Eucoenogenes*. Thus, two options are available for describing new species that cannot be assigned to another oletheutine genus and that are most similar to species currently assigned to *Eucoenogenes*: 1) restrict *Eucoenogenes* to the type species, represented by a single female specimen, and describe a new genus to contain species currently assigned to *Eucoenogenes* based on characters of the male genitalia, or 2) continue to describe new species within *Eucoenogenes* based on characters of the male genitalia and refine the definition of this group of species until such time that the male of *E. melanancalis* is discovered. Strong evidence is lacking to associate *E. melanancalis* with another genus or to disassociate it from other species currently assigned to *Eucoenogenes*. In addition, species currently assigned to *Eucoenogenes* display a wide range of variation in some characters, including the spiniform setae of the valvae. Thus, the latter option is adopted in order to further define this group of species by describing new species as they become known.

A wide diversity of sex scales is present in males of some species of *Eucoenogenes*, but none of these can be used to characterize the genus. A forewing costal fold was reported for *E. levatana* and *E. segregana* (Kuznetsov 1997a, b), a pair of hair pencils

on the eighth abdominal segment is present in *E. vanevae*, hindwing hair pencils and tibial sex scales are present in *E. bicucullus*, and sex scales are present on abdominal segments 3–5 in *E. cyanopsis*.

Several superficial characters of *Eucoenogenes munda*, *E. bicucullus*, and *E. vanevae* are shared with various other species assigned to *Eucoenogenes*. The second segment of the labial palpus has dark spots basally, dorsomedially, ventroapically and apically in *E. bicucullus*, *E. vanevae*, *E. aestuosa*, *E. cyanopsis*, and *E. japonica* (Fig. 4). The dorsomedial, ventroapical and apical spots are confluent in *E. munda* and *E. deltosoma*, and all spots are absent in *E. melanancalis*, *E. euphlebia*, and *E. ancyrota*. Descriptions of *E. levatana*, *E. segregana*, and *E. telifera* indicate that the labial palpi are uniformly colored. The forewing venation has  $R_4$  and  $R_5$  stalked for varying lengths with the stalk approximate and parallel to  $R_3$  in *E. munda*, *E. bicucullus*, *E. vanevae*, *E. euphlebia*, *E. aestuosa*, *E. cyanopsis*, and *E. japonica* (Fig. 6); veins  $R_4$  and  $R_5$  are separate in *E. ancyrota*, *E. deltosoma*, and *E. melanancalis*. The forewing lacks a well-defined basal fascia and has a subbasal fascia that is dislocated apically between the middle of the discal cell and the dorsal margin in *E. bicucullus*, *E. vanevae*, *E. aestuosa*, *E. japonica*, and *E. euphlebia* (Fig. 3). The forewing dorsum is suffused with the ground color that obscures expression of fasciae in *E. munda* (Fig. 1), *E. ancyrota*, and *E. pythonias*. The subbasal and basal fasciae are confluent without any dislocation in *E. melanancalis*.

All known males of species assigned to *Eucoenogenes*, except *E. ancyrota*, have male genitalia with a bifid uncus and socii that are elongate, apically rounded, and pendant from the base of the uncus. All known males of *Eucoenogenes* have long, spiniform setae on the sacculus, except *E. ancyrota*, in which the spiniform setae originate from the cucullus, and *E. teliferana*, in which spiniform setae are absent. These spiniform setae have longitudinal ridges



and windows between ridges and some have deeply bifid apices, similar to lamellar scales (Figs. 16, 17). The distinction between lamellar, multidentate scales on the abdominal sternites and rounded, non-dentate, spiniform setae on the valva is transitional among various species. Similar sacculus setae are present in some species assigned to *Acroclita* Lederer, although these are absent in the type species, *A. subsequana* (Herrich-Schäffer), which appears to be a very derived species based on both male and female genitalia. The Nearctic genus *Proteoteras* Riley also has spiniform setae on the valval sacculus, and its relationship with southern Asiatic groups requires investigation.

All examined females of *Eucoenogenes*, except *E. ancyrota* and the type species, *E. melanancalis*, have microtrichia on female sternum VI and VII. Based on a survey of almost 200 species of Olethreutinae collected in Thailand and more than 300 species and most genera of Olethreutinae in the Nearctic and Palearctic regions, microtrichia are present in other genera only on sternum VII of *Acroclita subsequana* and on sternum VI and VII of *Lathronympha strigana* (F.) (Grapholitini).

Females have a ductus bursae that is encircled by a long sclerotized band in all examined species except *E. euphlebia*, which has a short ductus bursae and short band. The sclerotized band has two anterior projections extending into the corpus bursae (Fig. 12) in *E. munda*, *E. bicucullus*, *E. aestuosa*, *E. cyanopsis*, *E. japonica*, and *E. euphlebia*, especially long and narrow in the last species; projections are reduced to broadly rounded lobes in *E. vanevae* and are absent in *E. ancyrota* and *E. melanancalis*. Similar projections of the sclerotized band of the ductus bursae have not been seen in other Olethreutinae. The presence of these anterior projections of the sclerotized band appears to be unique to some species of *Eucoenogenes*.

The presence of sternal microtrichia in the female in combination with spiniform

setae on the male sacculus appear to be the best characters for defining the group of species currently assigned to *Eucoenogenes*, even though neither are known to be present in the type species, and both are individually present in species of other genera. The anterior projections of the sclerotized band of the ductus bursae also may prove to be a character defining this group of species. *Eucoenogenes ancyrota* and *E. teliferana* do not appear to be congeneric with other species assigned to the genus. The spiniform spines originating from the cucullus in *E. ancyrota* are not considered homologous with the spiniform spines on the sacculus in other *Eucoenogenes*, and other characters shared by *E. ancyrota* with various *Eucoenogenes* species are lacking. Nonetheless, this species is maintained in *Eucoenogenes* because no other generic assignment can be made at present. The generic placement of *E. teliferana* will be indefinite until specimens of this species can be examined.

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